

### **REMARKS**

This is a full and complete response to the Office action dated June 14, 2007.

All comments and remarks of record are herein incorporated by reference. Applicants respectfully traverse these rejections and all comments made in the Office Action. Nevertheless, in an effort to expedite prosecution, Applicants provide the following remarks regarding the cited references.

#### **DISPOSITION OF CLAIMS**

Claims 11-13 and 15-32 are pending in the application. Applicants have incorporated the subject matter of claim 14 into claim 11 and canceled claims 14 and 33. Applicants add new claim 34 with support in the application in table 1. No new matter has been added.

#### **REJECTION UNDER 35 USC §103**

Claims 11-16, 23-26 and 33 stand rejected under 35 USC §103(a) as being obvious over **Winkler**, US 3,700,748. Applicants respectfully traverse this rejection.

The Examiner stated in the Office Action that the disclosure of **Winkler** provides a substantial range of polymer for which Applicants' range of 1,4 saturation would be met, in particular 60-80%. Furthermore, the Examiner argues that the entire foundation of the **Winkler** reference is to obtain "selectivity" and claims a method of selective hydrogenation.

Applicants respectfully assert that what is presented in the instant application and claims is a classic case of unexpected results. The instant claims recite a hydrogenation method which is selective to a much higher degree than in **Winkler**, and to a degree which is surprising and unexpected in view of **Winkler**.

Applicants respectfully note that the MPEP §2144.05(III) states that in the case of overlapping ranges, obviousness can be overcome by showing the criticality of the claimed range by a showing of unexpected results. *See also* MPEP 2144.08 (II).

Applicants respectfully note that in view of **Winkler**, for the whole starting 1,4-double bond content range of 35%-80%, it would not be possible to obtain a 1,4-double bond content of at least 30% and a vinyl content reduced to 5% after hydrogenation. This is because **Winkler** discloses that during hydrogenation, not more than 50% of the unsaturation in the 1,4-double bonds are removed. Therefore even if, according to the Examiner, there is an overlap for a polymer starting with a 1,4-double bond content of 60-80%, it is impossible according to **Winkler** to obtain the presently claimed selectivity for the entire range of 35-80%. However, Applicants have demonstrated this selectivity. **Winkler** teaches the equivalence of Ni, Fe and Co (col. 5, lines 13 – 16). Applicants' results show unexpected and superior results for the claimed range by use of an Fe catalyst. Thus, for these reasons alone no prima facie case obviousness can be shown.

However, even according to **Winkler's** own example, more than 50% of the unsaturation of the 1,4 double bonds are removed. For example, according to Example 1, the polymer used has a 1,2-double bond content of 46%. **Winkler**, col. 6, lines 14-20. Accordingly, the 1,4-double bond content of the same polymer would be approximately 54%. After 25 minutes of hydrogenation, the polymer is indicated to have an iodine number of 81. **Winkler**, col. 6, lines 28-30. According to the present application, an iodine number of 81 corresponds to a 75% conversion of initial unsaturated olefinic carbon-carbon double bonds. *Application*, page 3, lines 2-5.

Therefore, with 75% conversion of the carbon double bonds, even assuming that all the remaining unsaturation is 1,4-double bonds, there is still greater than 50% reduction of such 1,4-double bond unsaturation. This is because after 75% conversion, and assuming all of 1,2-double bonds were hydrogenated, and only 1,4 unsaturation remained, such 1,4 unsaturation would be about 25%.<sup>1</sup> However, generally, some of the

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<sup>1</sup> This calculation assumes that all 1,2 double bonds were removed. For example, all 46% of the 1,2 double bonds were hydrogenated, and the 1,4 was reduced to 25%. This adds to 75% total conversion of carbon-carbon double bonds.

1,2-double bonds would remain, and therefore the 1,4 unsaturation is likely even less than 25%.

This example then, shows greater than 50% reduction of the 1,4-double bond unsaturation, because the initial unsaturation level of 1,4-double bonds is 54%, and the final amount 25% or less.

However, according to the method of the instant claims, greater than 30% 1,4-double bond unsaturation after hydrogenation is obtained. Such selectivity is not disclosed or suggested by **Winkler**, and further **Winkler** teaches that such selectivity cannot be achieved.

The Examiner furthermore argues that the comparative examples of the present application do not replicate the reference because they are far more destructive than that disclosed in **Winkler**. Applicants respectfully disagree.

The **Winkler** reference indicates that Fe, Co, and Ni are all equivalent catalysts hydrogenation. **Winkler**, col. 5, lines 13-16. Applicants employ Co and Ni in the comparative examples. The **Winkler** reference also indicates that termination of the polymerization reaction can be done with alcohol, which is also employed in the comparative examples. Further, example 1 of **Winkler** employs a Ni catalyst as well as an alcohol for termination of polymerization. Additionally, Applicants would also like to point out that similar hydrogenation temperatures were used. In example 1 of the present application, the temperature of the reactor was kept constant at 40°C, while in example 1 of **Winkler**, the temperature “rose to 50°C.” *Application*, page 14, line 26-28, **Winkler**, col. 6, line 27. Thus the conditions are similar to that indicated in **Winkler**.

However, even if the Examiner disagrees that the conditions were similar, and believes that the conditions were more harsh in the examples of the present application, Applicants respectfully submit that this does not diminish the showing of the present examples. Even if the conditions were more harsh than in **Winkler**, this also means that Example 3 according to the instant claims was also conducted under harsh conditions, differing from the comparative examples only in having a higher temperature and catalyst used. *Application*, page 14, lines 30-34. However, superior results were still obtained.

As can be seen in Table 1 of the present application, after 35 minutes, comparative example 1's vinyl content was below 5%, and the 1,4-double bond content was below 30% at 27.3%. Comparative example 1 employed Ni as the hydrogenation catalyst. On the other hand, in Example 3 according to the instant claims, the catalyst Fe, at 10 minutes and 25 minutes showed much higher selectivity. At 10 minutes the vinyl content was 5.6%, while the 1,4-double bond content was 41.2%, and at 25 minutes, the vinyl content was less than 5% and the 1,4-double bond content was 35.3%, significantly higher than 30%. Such superior selectivity as according to Example 3 cannot be derived from **Winkler**. Thus, Applicants respectfully assert that due to such unexpected results, no prima facie case of obviousness can be established. Accordingly, Applicants respectfully request the above mentioned rejection be withdrawn.

Applicants also add new dependent claim 34, which recites that the starting 1,4 double bond content range is 35-54%. Support for this can be found in the Application in Table 1, where the starting 1,4 double bond content is 53.4%. MPEP §2163.05 (III) (discusses support with respect to range limitations). In the Office Action, the Examiner only asserts that for resins of 60-80% 1,4 structure is within the scope of the claims. Therefore a 1,4-double bond content range of from 35-54% prior to hydrogenation is not disclose or suggested by **Winkler**. Thus, Applicants respectfully submit that such claim is in allowable condition.

#### REJECTIONS UNDER 35 USC §103 OVER WINKLER IN VIEW OF WILLIS

Claims 17-22 and 27-32 stand rejected under 35 USC §103 as being rejected over **Winkler** in view of **Willis**, 4,396,761. Applicants respectfully traverse this rejection.

Applicants respectfully re-assert the remarks made above regarding **Winkler**, and further assert that even in view of **Willis**, no prima facie case of obviousness can be established. However, Applicants provide further remarks as follows.

Applicants respectfully note that instant claims 17 and 27 recite that the hydrogenation catalyst residue is extracted from the solution of hydrogenated polymer in the absence of an oxidation agent.

The Examiner states that “there is nothing in the reference which would indicate that any oxidation reaction has occurred,” and “there is no basis to conclude that oxygen was present in the reference method.” Applicants respectfully disagree.

Applicants respectfully assert that the process as disclosed in **Willis** is an oxidation reaction and occurs in the presence of air. As indicated in col. 5 lines 2-5, “for the latter metals in the zero valent state contact with alpha-hydroxysulfonic acids in the presence of air will convert them into ionic metals which are then chelated.” (emphasis added). The conversion of metal from the zero valent state into an ionic metal is an example of an oxidation reaction in which the metal is being oxidized into an ion due to a loss of electrons.

Therefore, **Willis** explicitly discloses the extraction of hydrogenation catalyst residue (i.e. metal) from the solution of hydrogenated polymer in the presence of air. **Willis** Col. 5 lines 2-5. Applicants respectfully note that oxidation agents can include oxygen, and therefore extractions taking place in the presence of air, which contains oxygen, in fact have an oxidation agent present. Thus the examples of **Willis**, wherein extraction is disclosed, take place in the presence of air as the oxidizing agent. As **Willis** discloses that air as an oxidizing agent must be present, the reference teaches against the instant claims.

Accordingly, no prima facie case of obviousness can be established, and the extraction steps recited in claims 17 and 27 of the present application are not disclosed or suggested by **Winkler** in view of **Willis**.

In view of the foregoing, Applicants respectfully request that the above 35 USC §103 rejection be withdrawn.

In order to facilitate the resolution of any issues or questions presented by this paper, the Examiner is invited to directly contact the undersigned by phone to further the discussion.

The undersigned representative requests any extension of time that may be deemed necessary to further the prosecution of this application.

The undersigned representative authorizes the Commissioner to charge any additional fees under 37 C.F.R. 1.16 or 1.17 that may be required, or credit any overpayment, to Deposit Account No. 14-1437.

**Conclusion**

Having addressed all issues set out in the Office action, Applicants respectfully submit that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,  
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